VACCINE EFFICACY IN SWINE CHALLENGED WITH A HIGHLY VIRULENT *S.* TYPHIMURIUM

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Abstract Vaccination is one of several options to reduce the impact of *Salmonella* infections in pork. To demonstrate cross protection against infection with *S.* Typhimurium, pigs were vaccinated with a live vaccine (Enterisol® SC-54, Boehringer Ingelheim Vetmedica, Inc.), left as positive challenge controls or negative, non challenged controls. Vaccination demonstrated significant clinical protection and reduction of lymph node colonization. In addition, nominal improvement in weight gain was also detected.

Introduction According to a Center of Disease Control and Prevention estimate, 1.4 million individuals in the US suffer from *Salmonella*-associated disease every year (Mead *et al*, 1999). The most important serovar in this context is *S.* Typhimurium, which accounts for 21.9% of all *Salmonella* isolates. *S.* Typhimurium is also the most frequently isolated serovar from clinical pig samples (CDC, 2002). As pork products are frequently associated with clinical Salmonellosis in humans (Steinback, *et al*, 1999), *S.* Typhimurium control in pigs is an important food safety issue. Whereas *S.* Typhimurium can cause enterocolitis in pigs, the majority of infections prevail subclinically resulting in substantial economic losses due to a reduction in daily weight gain (Nielsen JN *et al*. 1997). The purpose of this study was to determine if Enterisol SC-54, which is based on an attenuated *S. cholerasuis* strain, can be used to control *S.* Typhimurium in pigs.

Materials and Methods The study consisted of 3 groups. Group 1 (21 animals) was vaccinated at day 0 with 2 mL Enterisol SC-54. At day 28, group 1 and group 2 (21 animals; challenge control) were challenged with 2 mL virulent *S.* Typhimurium (BIVI 02-04) culture. Group 3 (20 animals) served as strict control. Criteria to determine protection included display of clinical symptoms, weight gain, fecal shedding of *Salmonella*, and the results of the pathological examination (presence of gross-lesions, colonization of inner organs by *Salmonella*), which was conducted two weeks after challenge. Shedding of the vaccine strain and seroconversion (IDEXX *Salmonella* Herd CheckTM) were monitored. The data was analyzed using a SAS environment. Applied tests included ANOVA and Chi-Square/Fisher's Exact analysis.

Results Compared to the non-vaccinated challenge control group, the Enterisol SC-54 group showed significantly ($p \leq 0.05$) fewer clinical symptoms relevant to their general well-being. There was also a significant ($p \leq 0.05$) reduction in the prevalence of respiratory symptoms, loose feces/diarrhea, and decreased hydration. A significant ($p \leq 0.05$) reduction in the prevalence of enteropathy/enteritis affecting the small intestine, as well as a significant ($P \leq 0.05$) reduction of the *Salmonella* recovery rate from the mesenteric lymph node compared to non-vaccinated pigs was also observed in the Enterisol SC-54 vaccinated animals (Table 1).

In addition, the vaccinated animals showed a nominal increase in average daily weight gain post-challenge (days 27-42; 486 vs. 386 gm/day) and weight at the end of the trial (day 42; 28.2 vs. 26.2 kg) compared to the challenge control group. Fecal shedding post-challenge was not completely prevented by vaccination.

Discussion One of the vaccinated animals died of Salmonellosis after challenge, compared to four animals in the challenge control group. The animals did not sero-convert following immunization. Statistical significant shedding of the vaccine strain was not observed in the Enterisol SC-54 animals compared to the non-vaccinated controls. The results of this study demonstrated that vaccination with Enterisol SC-54 resulted in significant levels of protection following challenge with a virulent *S.* Typhimurium strain.

Conclusions This indicates that Enterisol SC-54 can be a valuable asset in the control of *S.* Typhimurium due to the reduction of economic losses from *S.* Typhimurium-associated clinical and subclinical symptoms, as demonstrated in prior studies. Vaccination with Enterisol SC-54 does at the same time not impair serological evaluation of individual animals or whole herds due

to the lack of detectable seroconversion following immunization and reduces mesenteric lymph node colonization.

References

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Table indicates positive findings in %	Enterisol® SC-54	Challenge Control	Strict Control
Impaired General Well Being	2.25*	7.64	0 .00
Respiratory symptoms	0.00*	5.05	0.00
Decreased hydration	0.78*	4.80	0.00
Loose feces/diarrhea	9.71*	19.43	0.00
Enteropathy/enteritis (small intestine)	10.00*	73.33	35.29
Salmonella recovery MLN	36.84*	73.33	0.00

Table 1: Statistical significant differences between groups regarding clinical, pathological, and bacteriological findings. *Differences between Enterisol SC-54 and Challenge Control groups are statistical significant ($p<0.05$; Chi-Square/Fischer's Exact analysis).